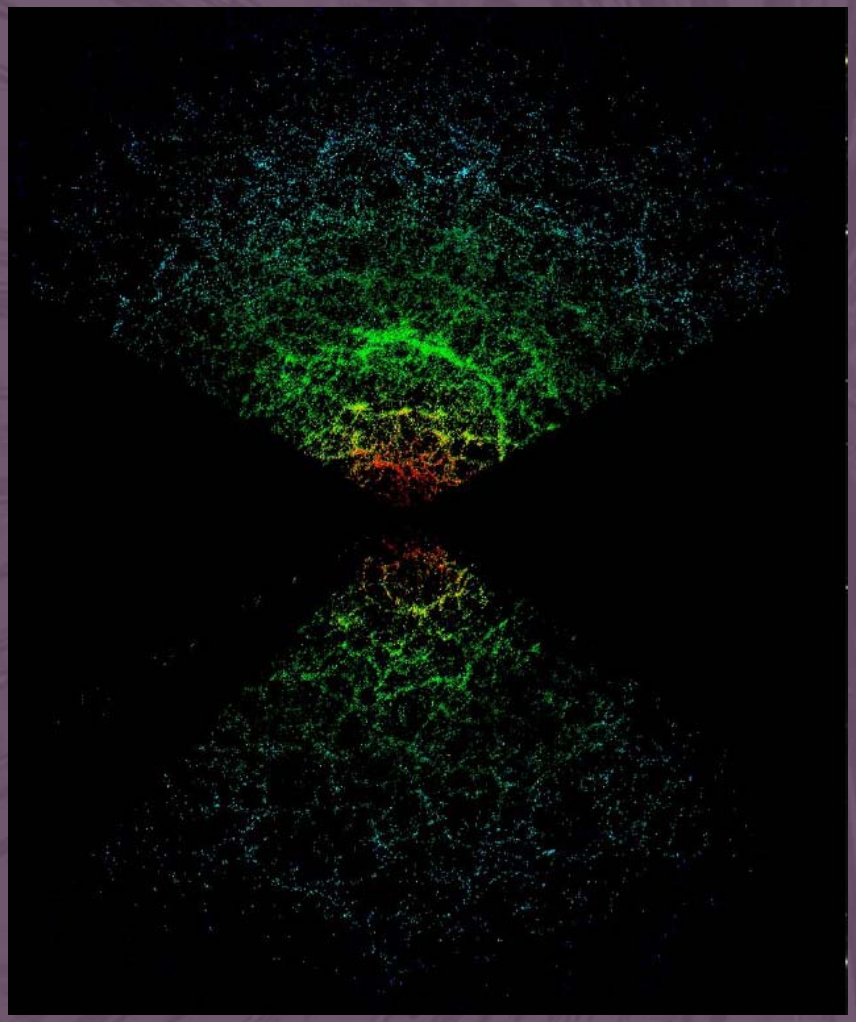
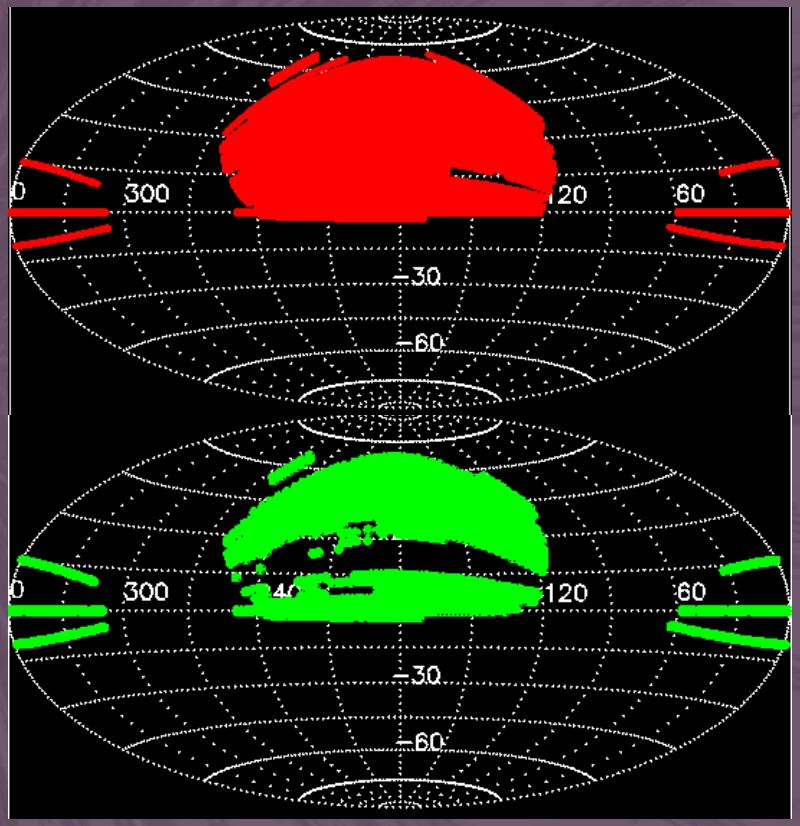
Legacy Survey Science

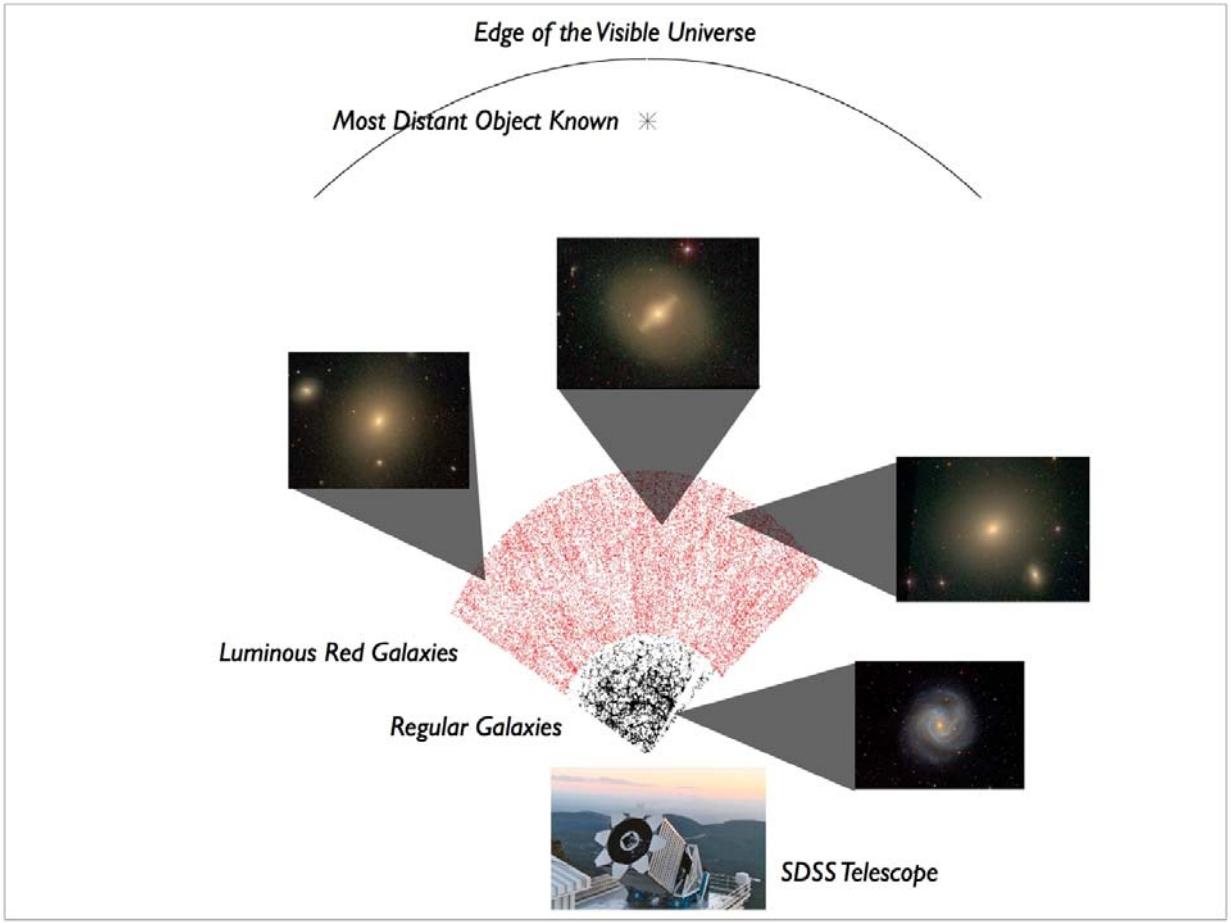




Structure on the largest scales, with LRG photo-z's

Padmanabhan, Schlegel, Seljak, et al.

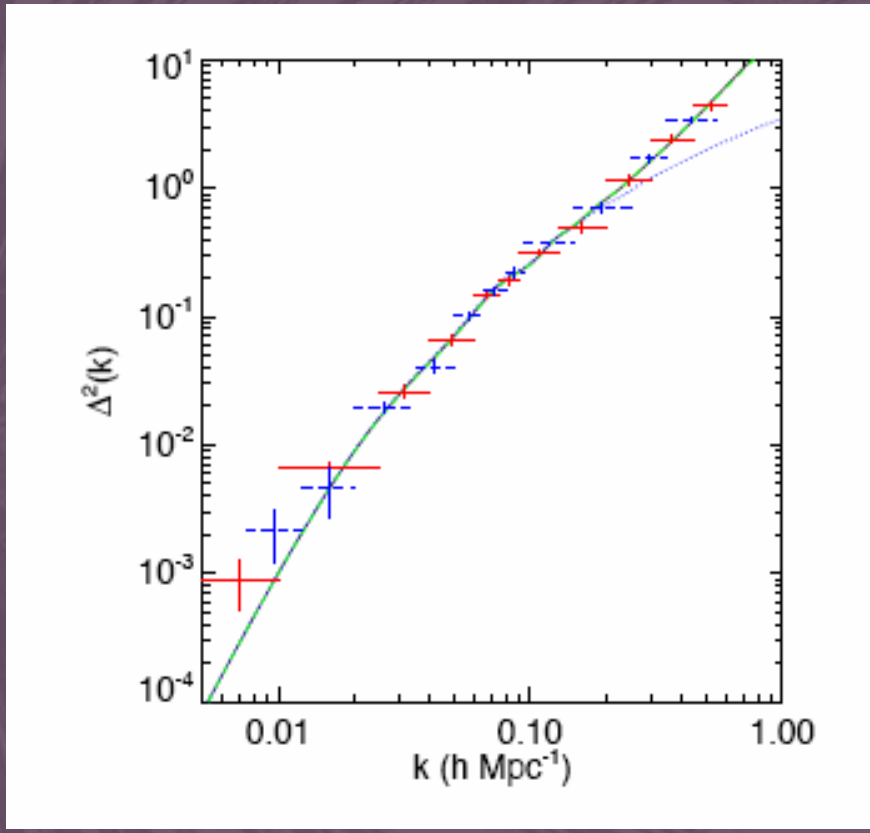
Blake, Collister, Bridle, & Lahav



Structure on the largest scales, with LRG photo-z's

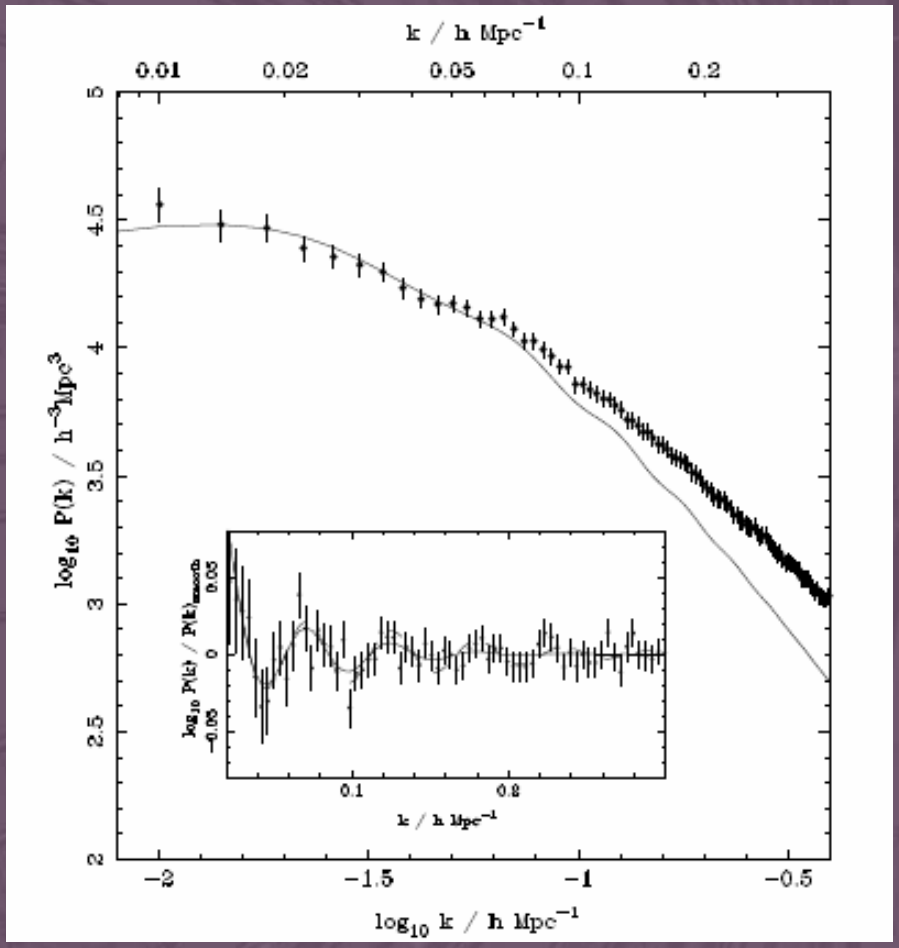
Padmanabhan, Schlegel, Seljak, et al.
Blake, Collister, Bridle, & Lahav

- 10^6 LRGs, to z=0.8
- Calibrated with spectroscopic redshifts from SDSS-2dF collaboration
- Measurement of galaxy power spectrum on unprecedented scales
- Sharpened cosmological parameter constraints (e.g., Ω_m) by factor ~2

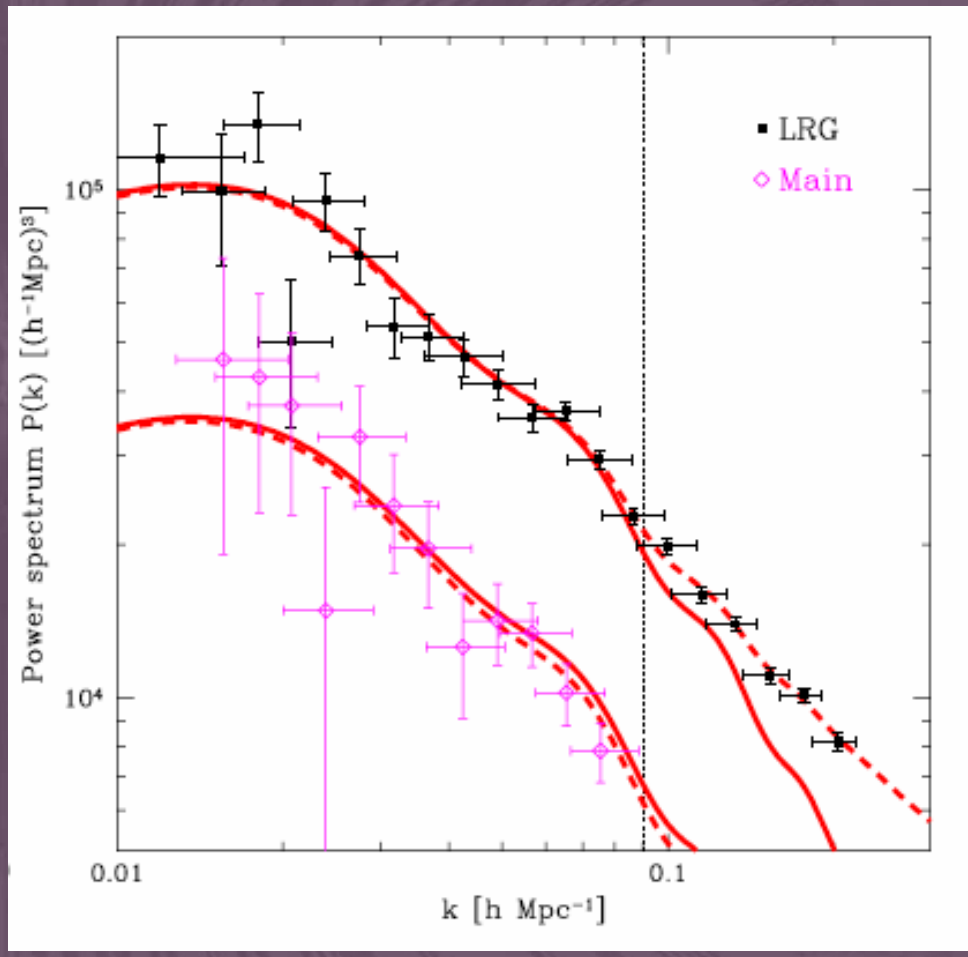


Galaxy power spectrum from the DR5 redshift surveys

Percival, Nichol et al.

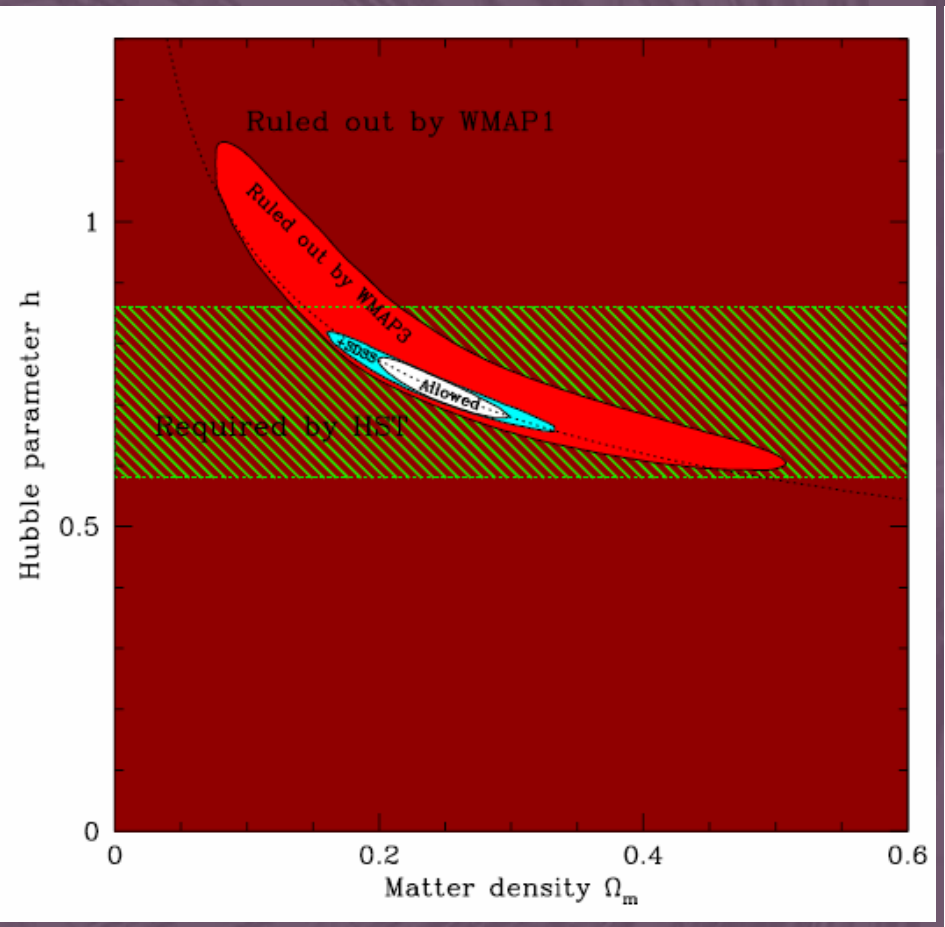


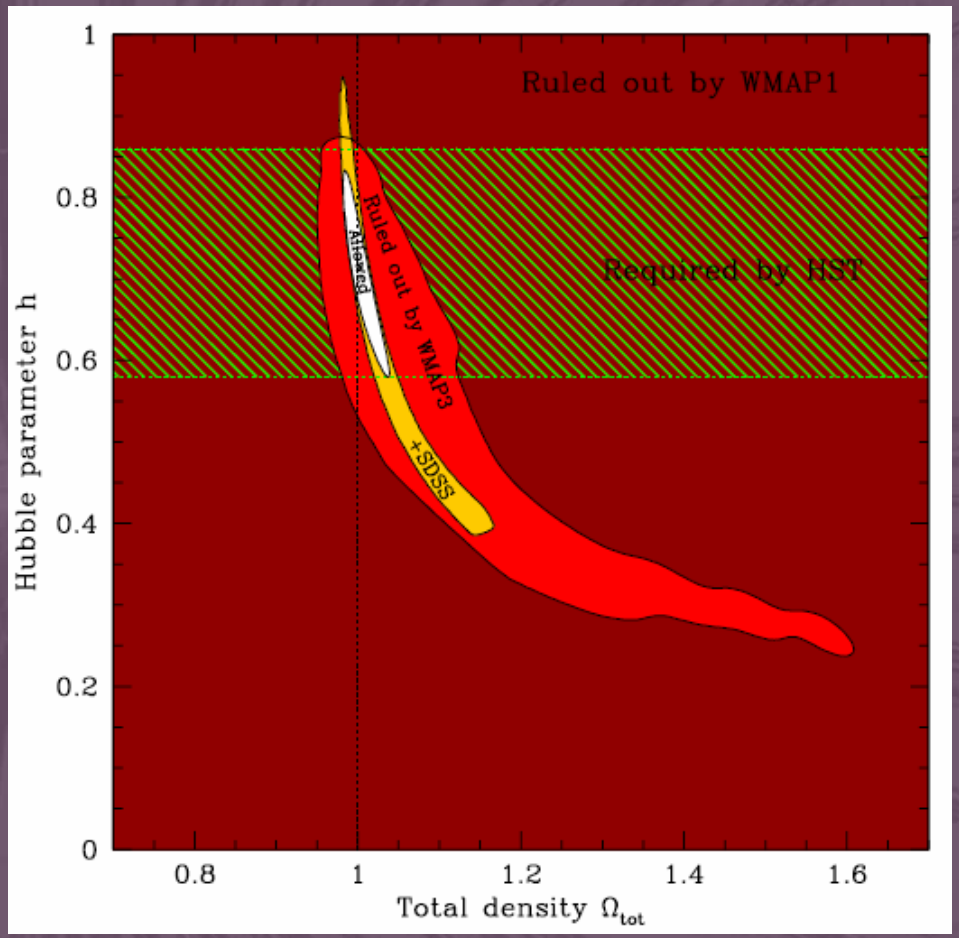
Tegmark, Eisenstein et al.



Galaxy power spectrum from the DR5 redshift surveys

Tegmark, Eisenstein et al.

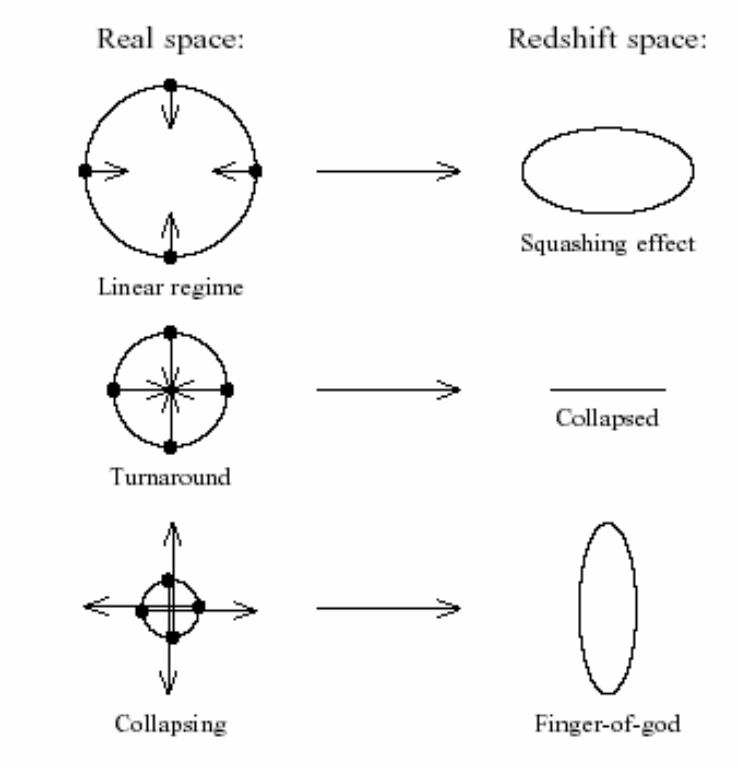


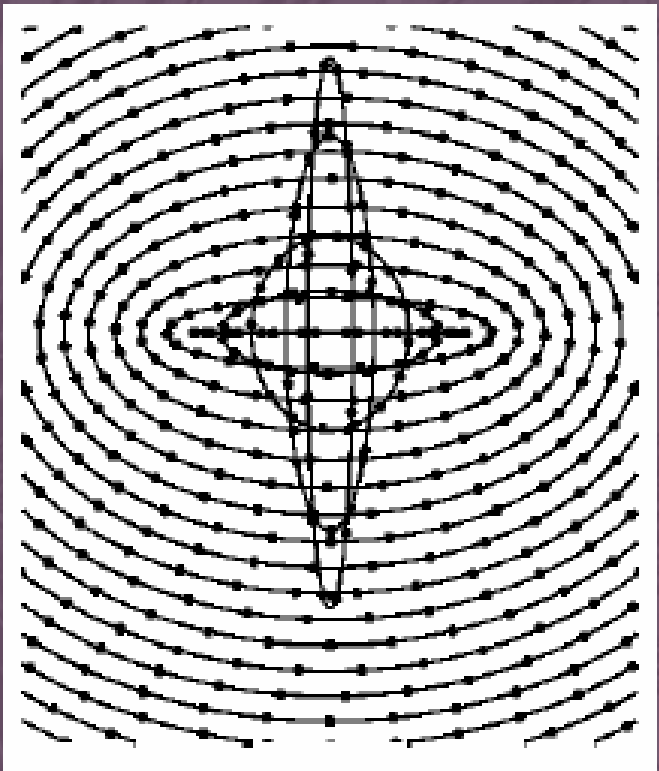


WMAP3 + SDSS P(k) together yield tight constraints, break many degeneracies. Baryon oscillation measurement helps a lot.

Redshift-space Distortions

Hamilton (1997)

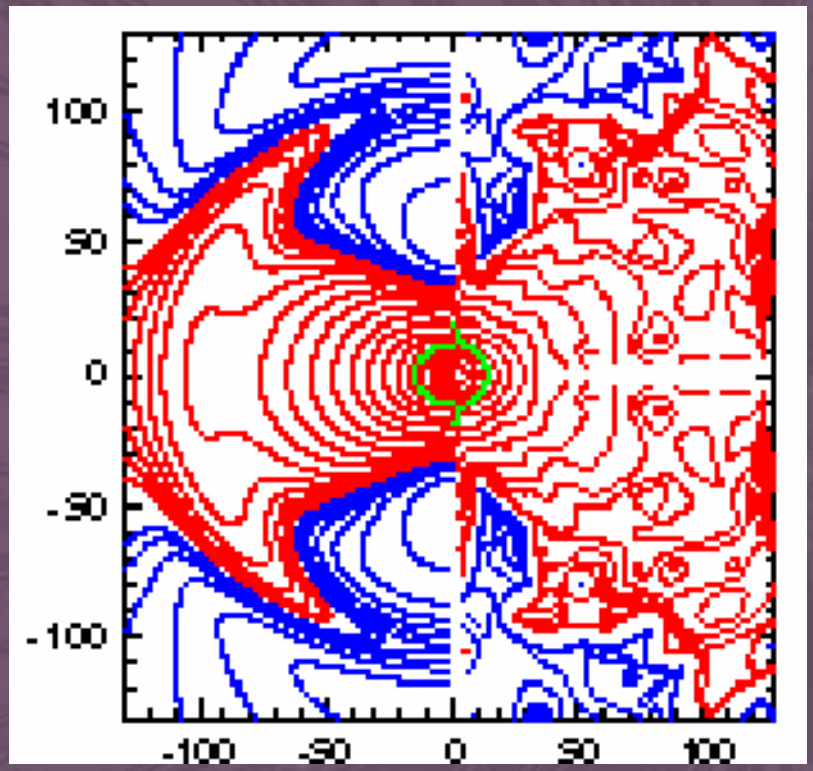




Diagnostic of mean matter density, amplitude of dark matter clustering, spacetime geometry

Redshift-Space Distortions

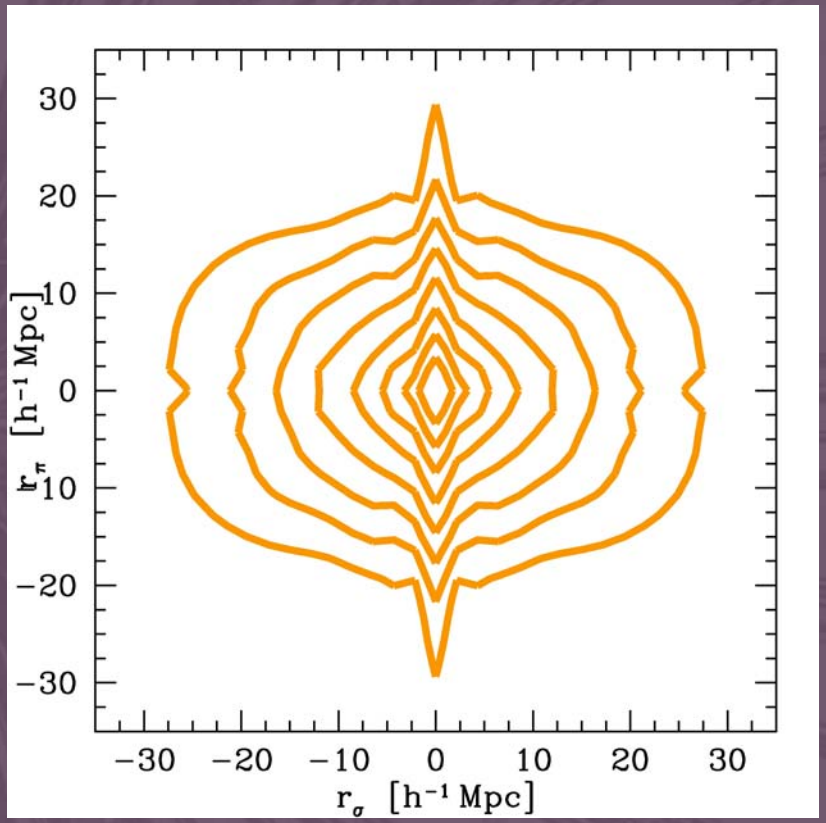
Model Data



Large scales, z~0.3, LRGs

Okamura, Matsubara, et al.

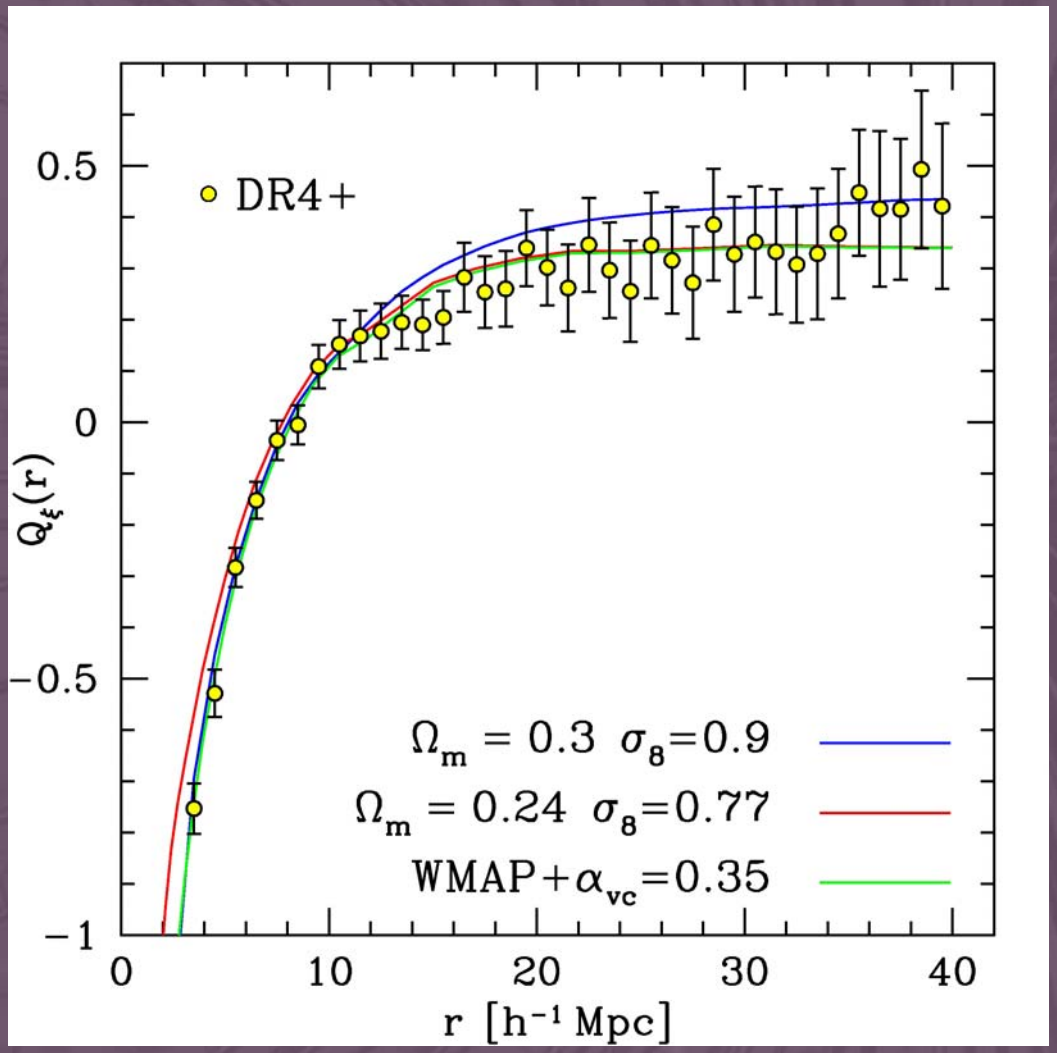
Contours of $\xi(r_p,r_\pi)$



Intermediate scales, z~0.1, main galaxy sample

Tinker, Weinberg, Zehavi et al.

Redshift-Space Distortions

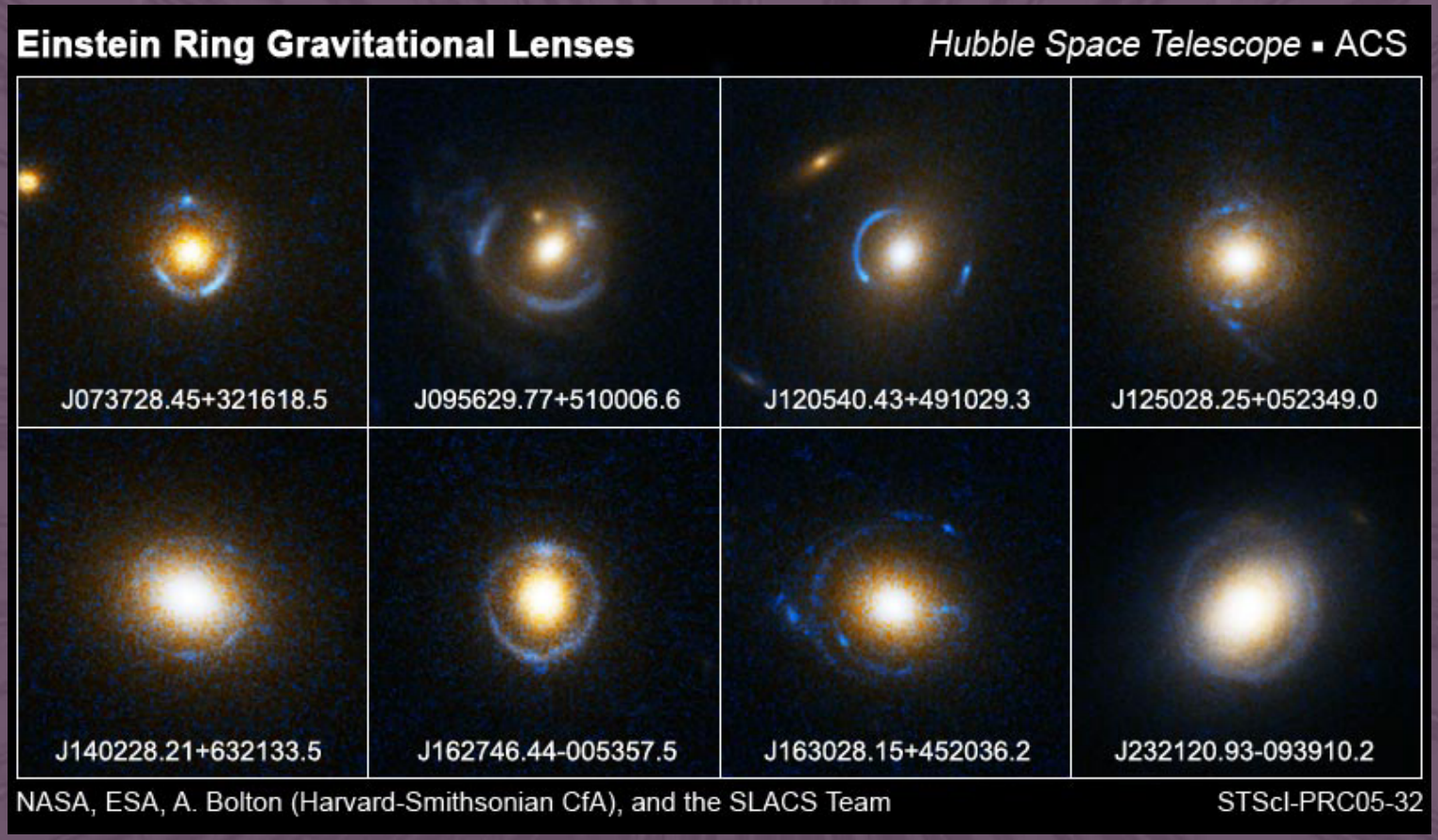


Accurate modeling of non-linear dynamics and "bias" between galaxies and dark matter is major challenge.

Results favor lower matter density and/or matter clustering amplitude compared to conventional "concordance" values (Ω_m=0.3, σ_8=0.9).

Tinker, Weinberg, Zehavi et al.

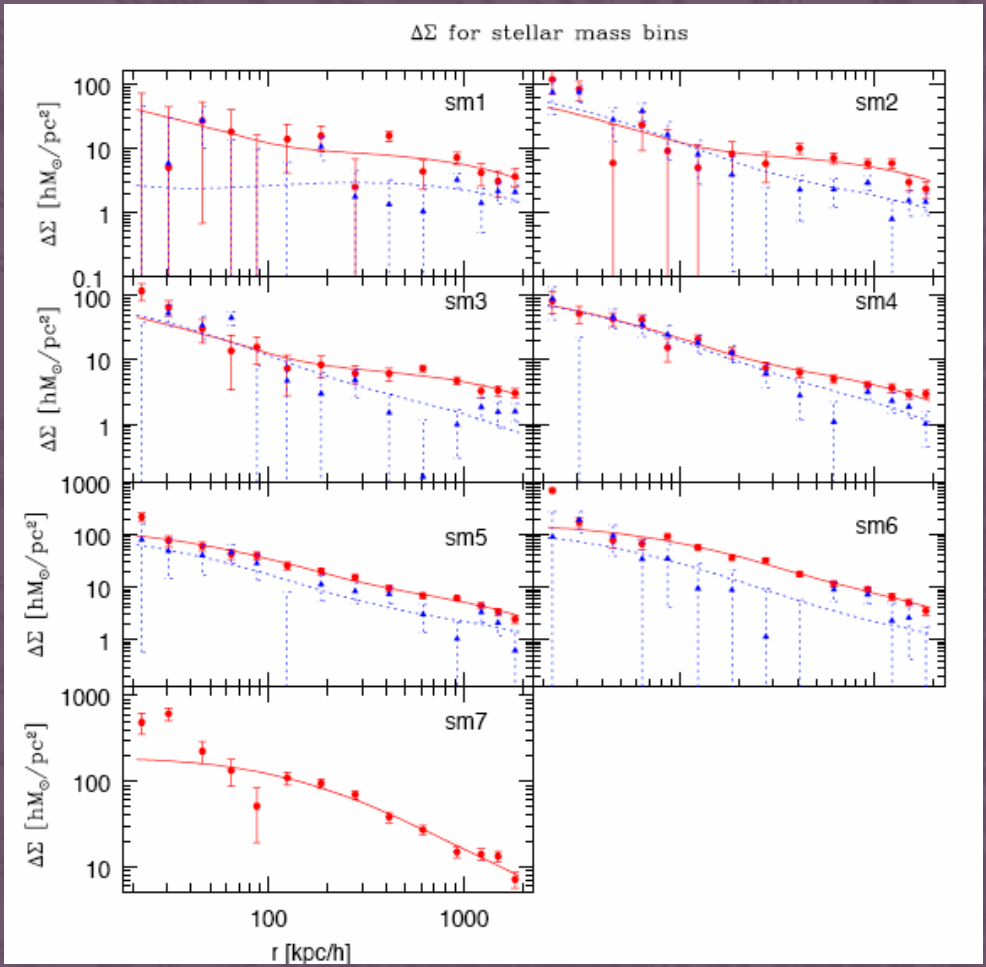
Dark Matter Around Galaxies



SLACS survey of SDSS lenses: Elliptical galaxies have "flat" circular velocity profiles

Bolton, Burles, et al.

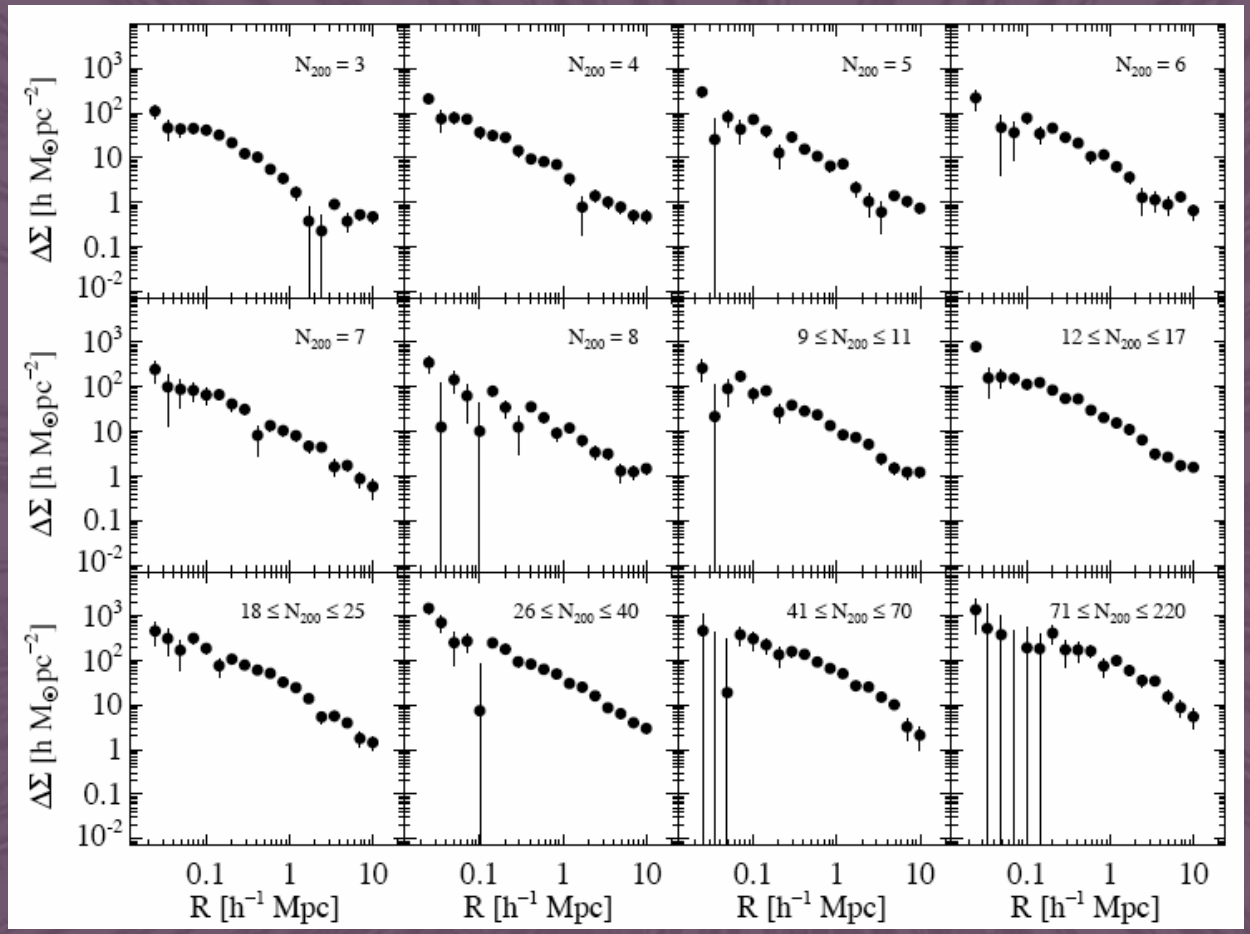
Dark Matter Around Galaxies



Galaxy-galaxy lensing: Extended mass profiles of galaxies as function of stellar mass, type, environment

Mandelbaum, Seljak, Kauffmann, Hirata, et al.

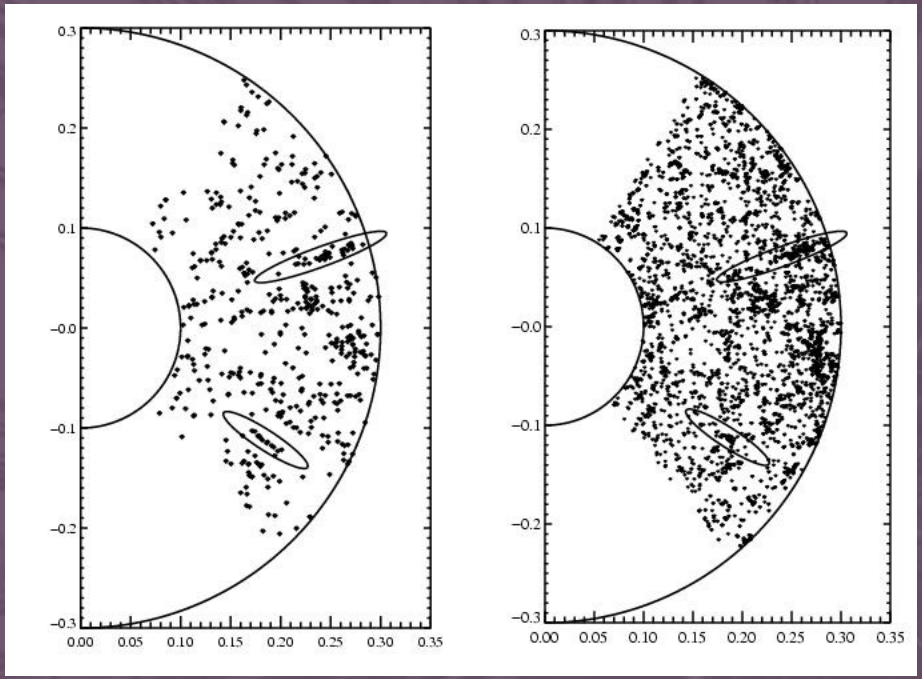
Dark Matter Around Clusters



Cluster-galaxy lensing: Extended mass profiles of galaxy clusters as a function of richness

Sheldon, Johnston, Scranton, Koester, McKay, et al.

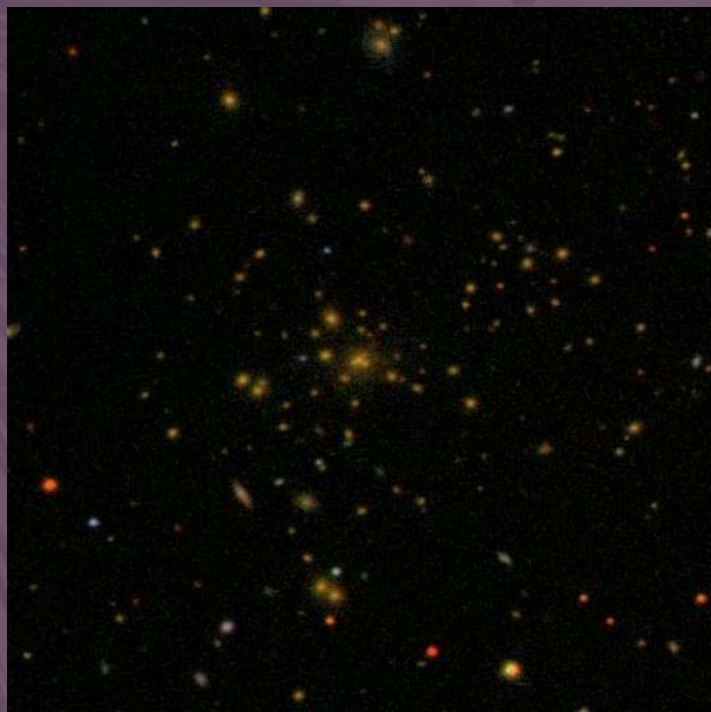
Cluster Catalogs



Koester, McKay, Annis, et al.

Catalog of 14,000 clusters from North Galactic Cap submitted for publication.

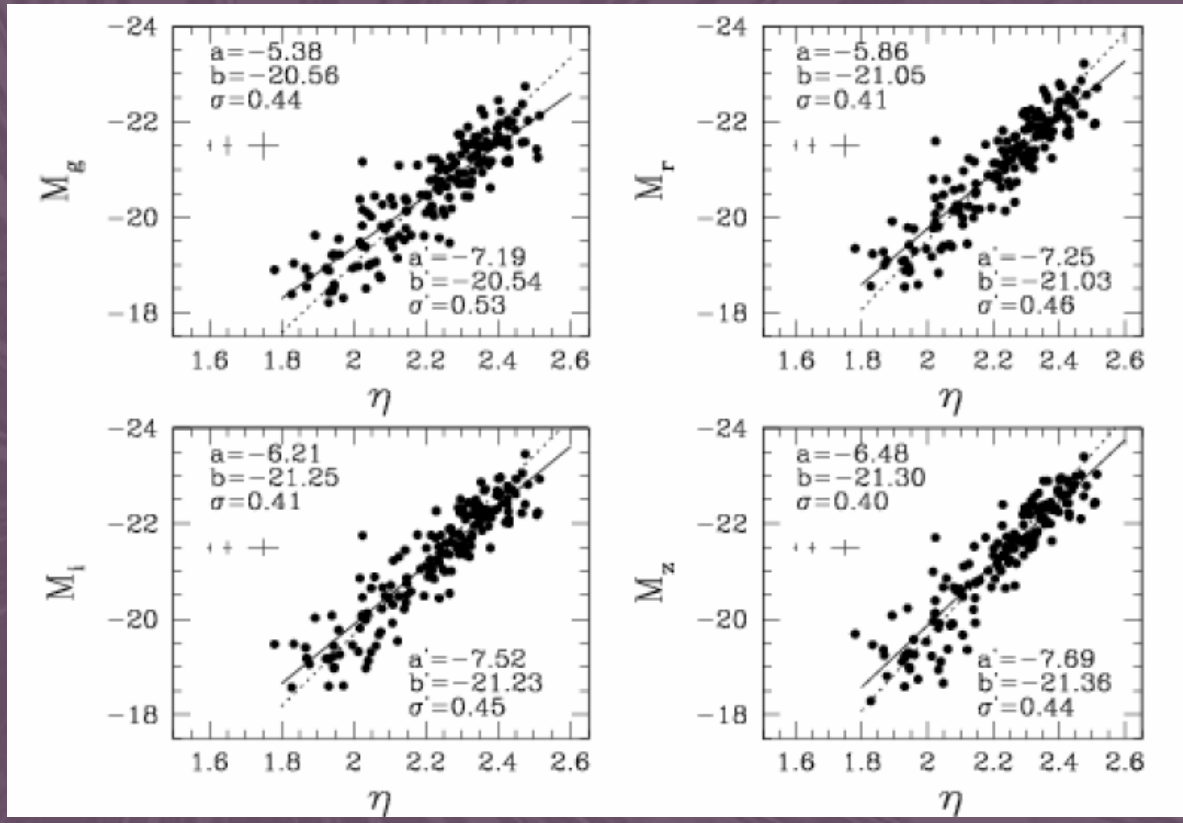
Catalog from co-added Southern Stripe in preparation.



Galaxy Scaling Relations

Luminosity-rotation speed (Tully-Fisher) relation for a broadly selected sample of disk galaxies, from follow-up Hα rotation curves.

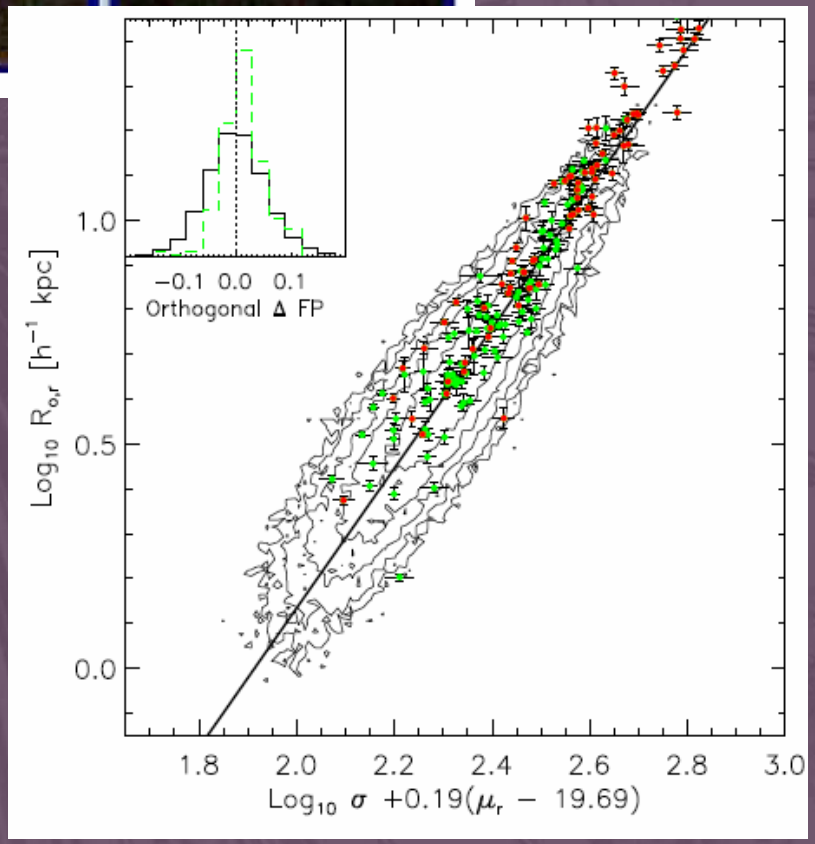
Well defined constraints for models of galaxy formation, especially regarding intrinsic scatter and residual correlations.



Pizagno, Prada, Weinberg, Rix, et al.

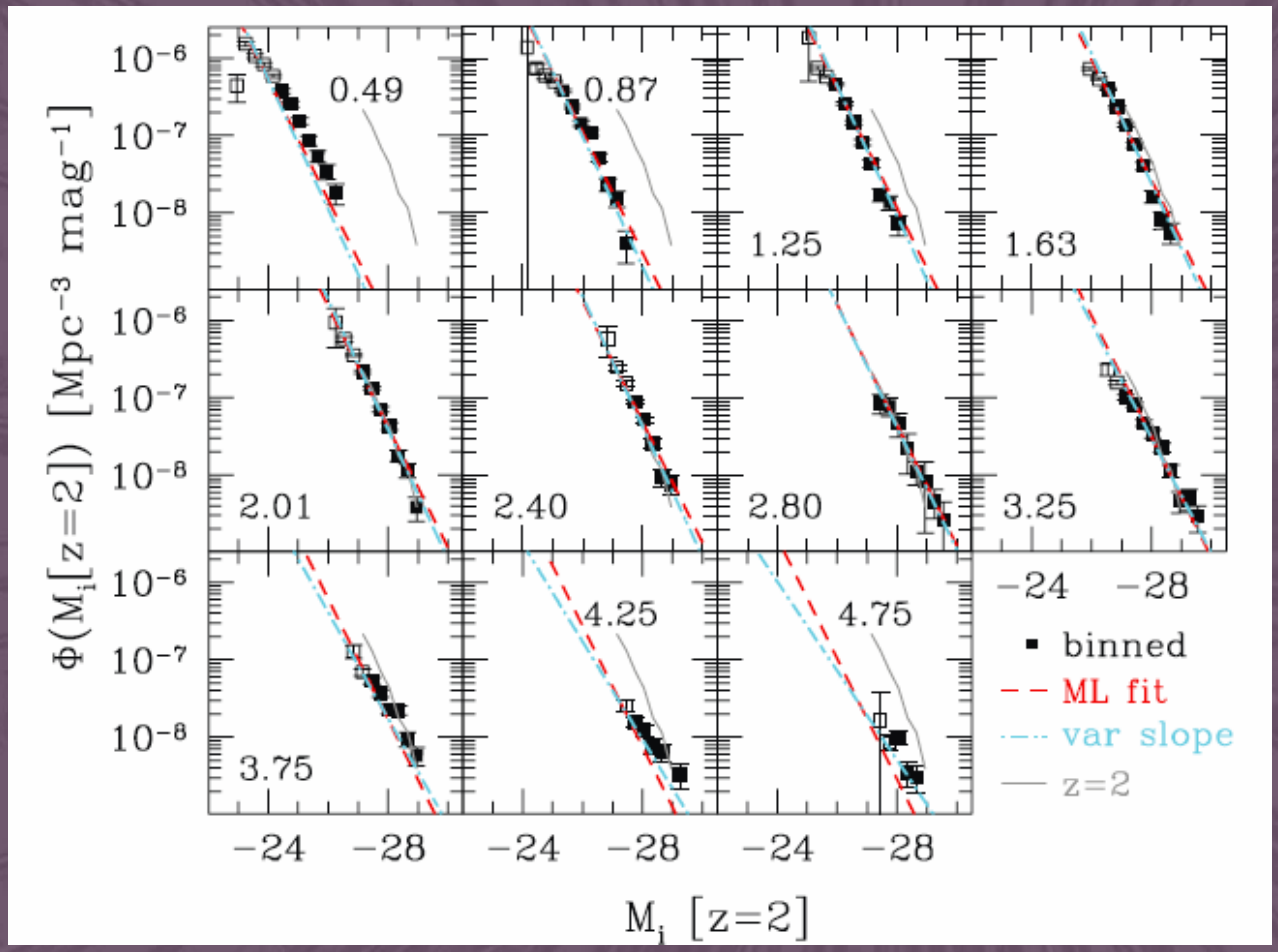
Galaxy Scaling Relations

Brightest cluster galaxies follow similar fundamental plane to regular elliptical galaxies, with slightly smaller scatter.



Bernardi, Hyde, Sheth, Miller, Nichol

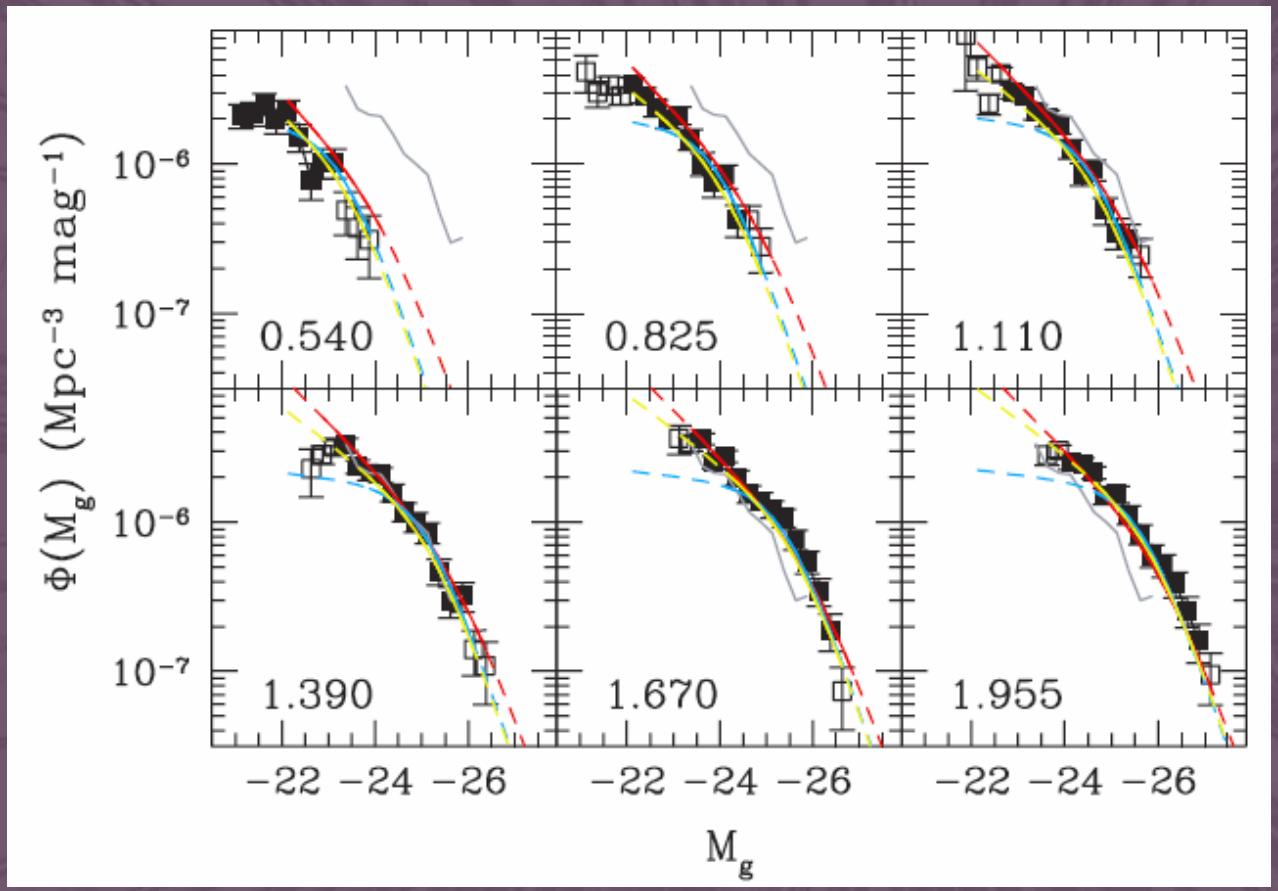
Quasar Luminosity Function



Luminous quasars from DR3 sample

Richards, Strauss, Fan, Hall, Jester, Schneider, Vanden Berk, Stoughton, et al.

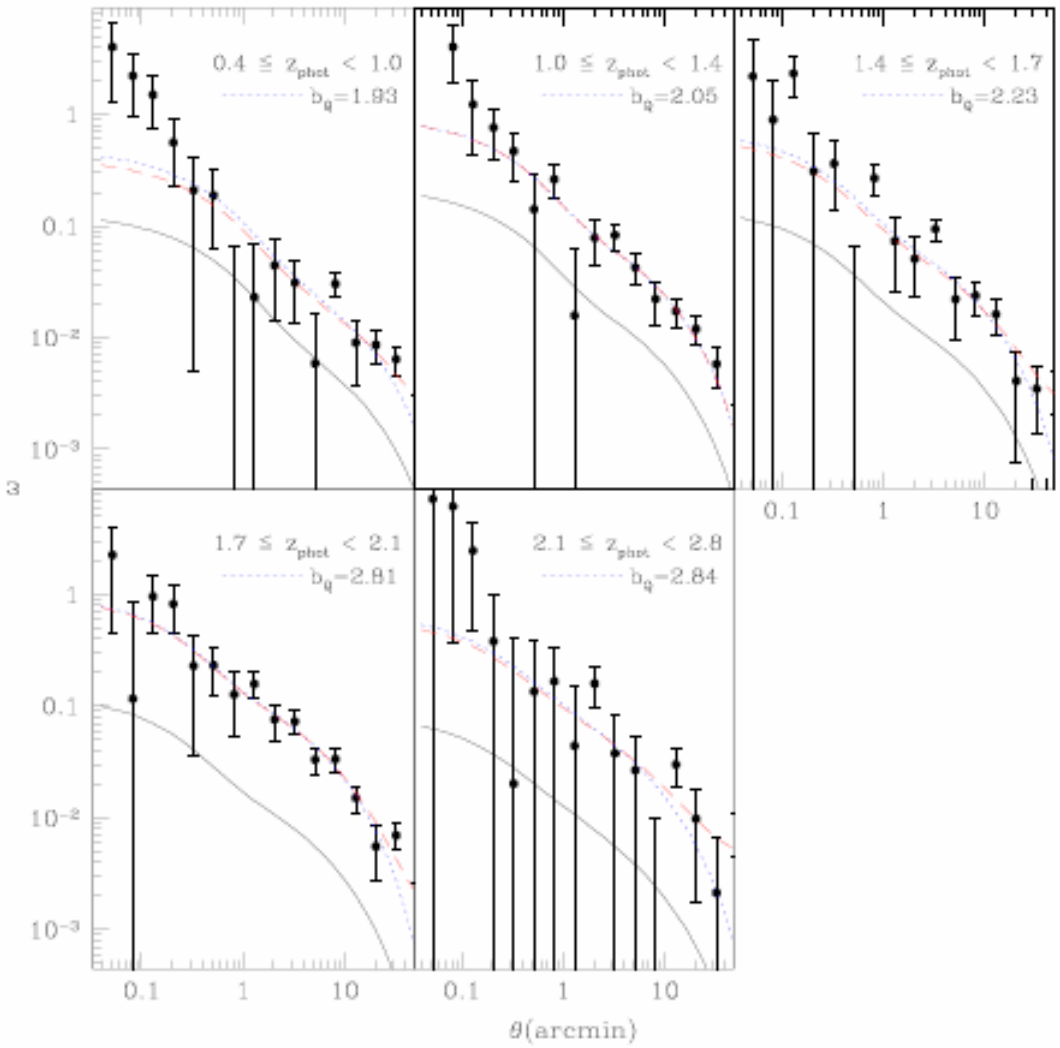
Quasar Luminosity Function



Fainter quasars, from 2SLAQ survey

Richards, Croom, et al.

Quasar Clustering



Angular clustering of quasars with photo-z's shows evolution of bias, small scale excess relative to expected dark matter clustering.

Luminous, high-redshift quasars (z>3) are much more strongly clustered (Shen, Strauss, et al.)

Myers, Brunner, Nichol, Richards, et al.

Summary

Now largest and most powerful sample for large scale structure. LRG sample superb probe of largest scales.

Key challenge is modeling relation between galaxies and mass, to learn about galaxy formation and extract cosmological constraints.

Galaxy science continuing with lensing studies, auxiliary data. SDSS providing z=0 anchor for evolutionary studies with COMBO-17, DEEP2, GEMS, etc.

Wide and deep galaxy cluster catalogs enabling cluster science: lensing, scaling relations, correspondence with other wavelengths.

Major progress on quasar luminosity function, quasar clustering.